Loudoun County, Virginia

Wireless Broadband

"Gap Analysis"
for
Wireless Facilities
2014

THE ATLANTIC GROUP
OF COMPANIES, INC.

April 17, 2014

Scope

- PURPOSE

The purpose of this Project is to:

– Conduct an initial "high-level" study of cellular and mobile broadband (3G & 4G) coverage gaps in the territory of Loudoun County.

The primary focus of this study should be:

– Western, more rural, half of the County with the primary objective focusing on:

  - major coverage gaps
  - commuting rush-hours along arterial and feeder roadways that pose a public safety hazard.

Process

- Using data supplied by The Atlantic Group and Loudoun County.
  - **Loudoun County: 2002 Master Wireless Telecommunications Plan**
  - **Loudoun County: 2007 Update of the 2002 Master Wireless Telecommunications Plan**
  - **Loudoun County Geographic Information System – (GIS)**
  - **Loudoun On-Line Land Applications –(LOLA)**
- Consider scenarios based on various tower heights (AGLs):
  - 195 ft., 120 ft. & 80 ft.
- Consider tower needs based on two basic technologies and their propagation traits:
  - **Technology #1 (Mobile Broadband) =Example: Verizon, AT&T, T-Mobile, Sprint etc.**
    - **Cellular (LTE/4G) (900 MHz & 1.9 -2.1 GHZ) (Verizon – HomeFusion)**
  - **Technology #2 (Fixed Broadband) = WISP : Point-Multi-Point**
    - **WISP (Wireless Internet Service Provider) Broadband spectrum**
    - **2.4 and 2.5 GHz**
    - **4.9 and 5.8 GHz**

What Lane and Speed are your Cruising in the Information Super highway?

Right Lane ?

- Recreational traveler?
- E-mails, Text, Skype, Movies, YouTube etc. ?
- Speed : 1 Mbps to 4 Mbps

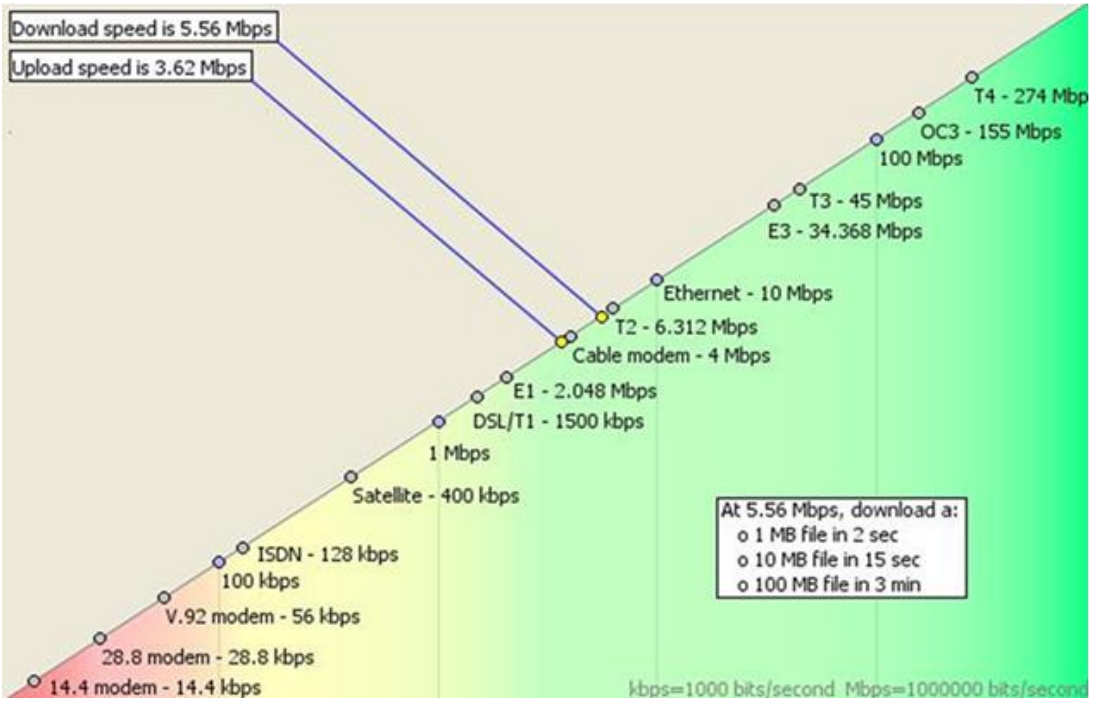
Center Lane ?

- Distance Learning?
- Telemedicine?
- Home-based business ?
- Telecommuter?
- Speed: 4 Mbps to 10 Mbps

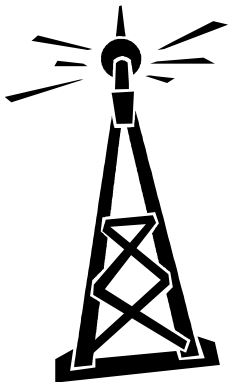
Fast Lane ?

- Heavy data user with applications?
- Telecommuter- IT ?
- Commerce and Investment?
- Speed: 10 Mbps +

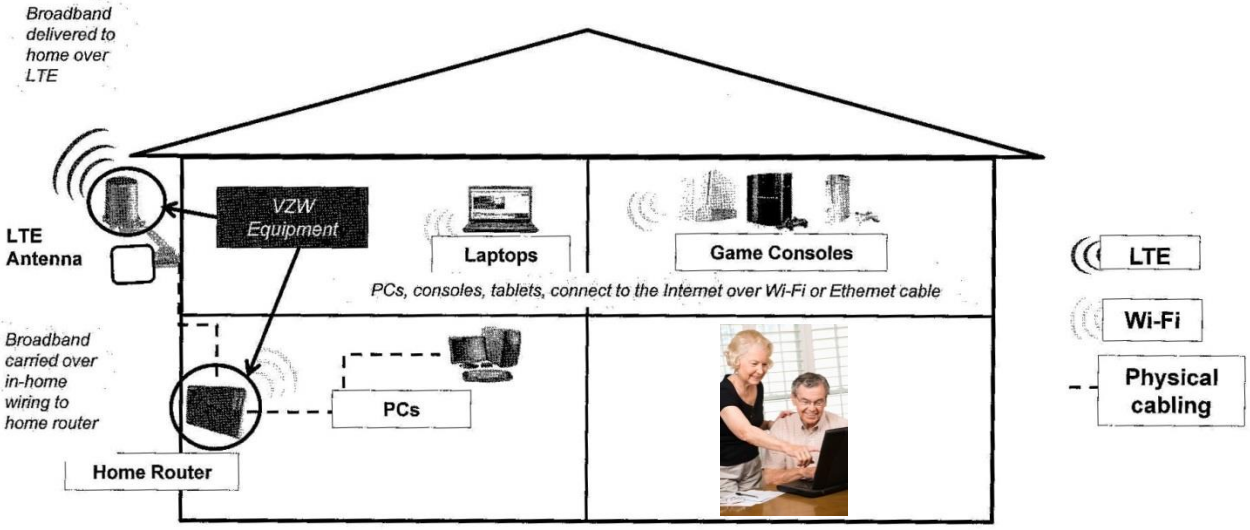
What Speed are you willing to pay for?



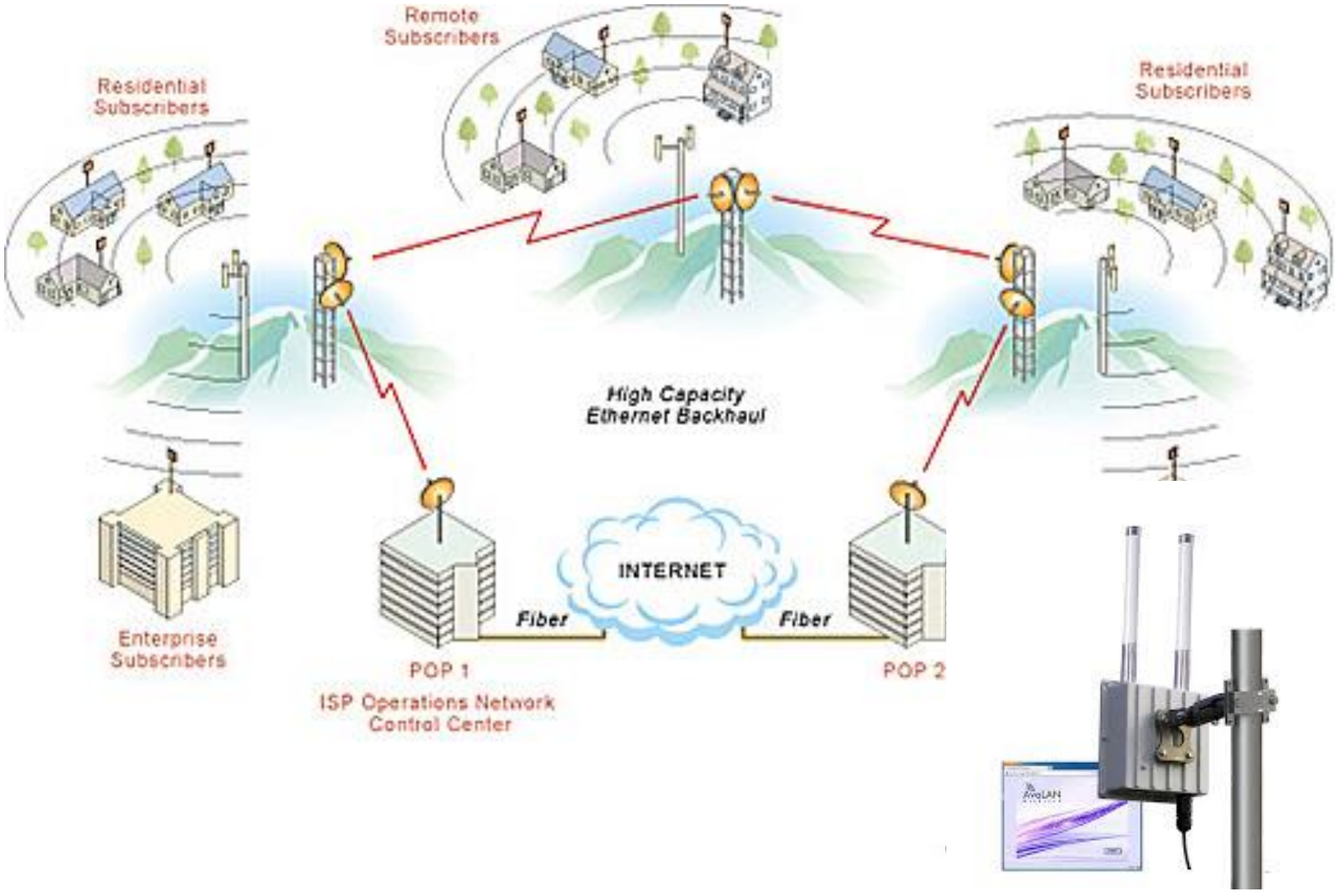
Technology #1 : Mobile Broadband: Example – Verizon "HomeFusion" Service



HomeFusion



Technology #2 – WISP-Point to Multi-Point: Private Service Providers

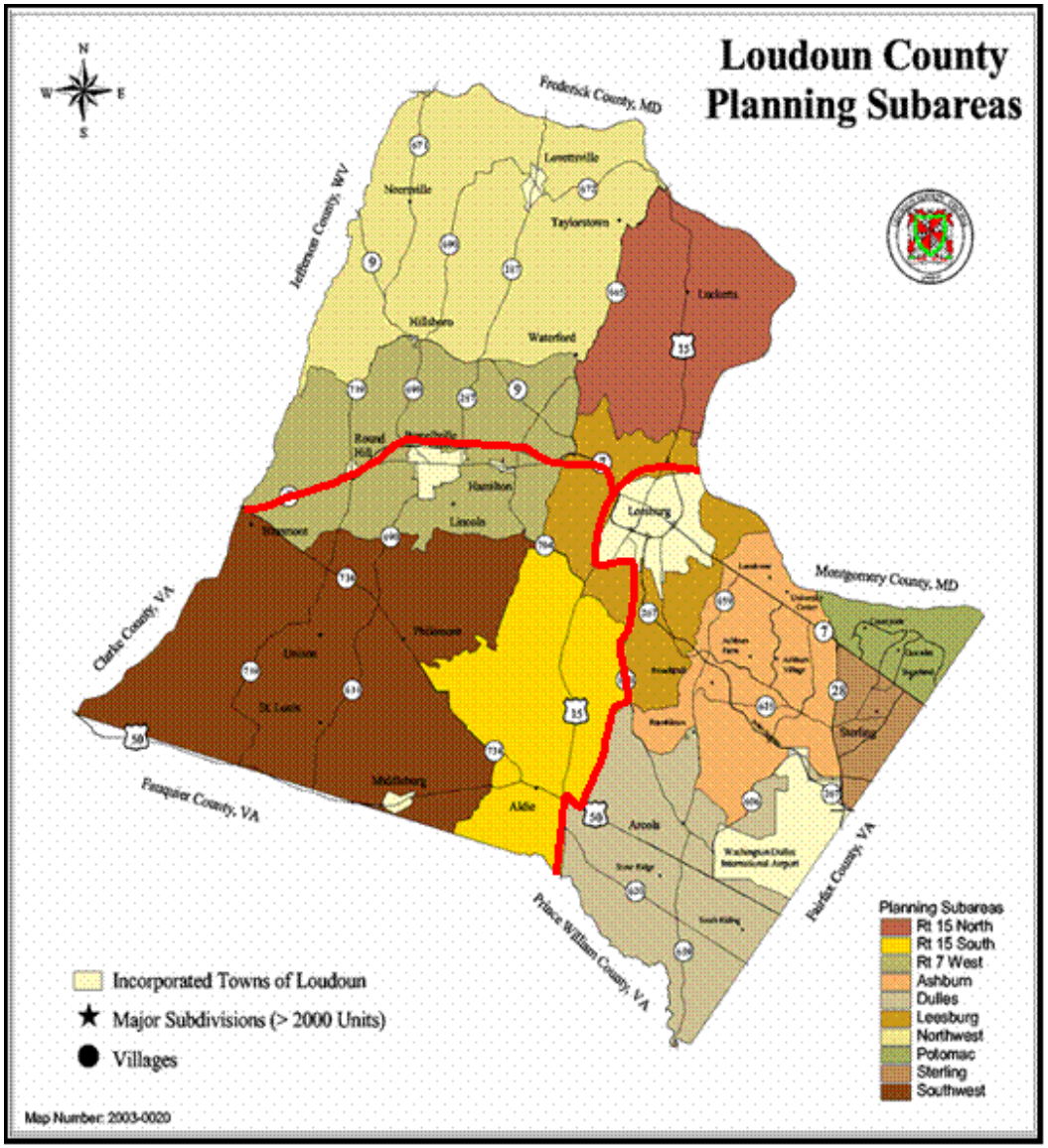


Geography

County divided into

Three (3) geographic areas of Loudoun

- **"Northern" Region**
  - **Rt. 7 and North of Leesburg**
- **"Southern" Region**
  - **Rt. 7 and West of Rt. 621**
- **"Eastern" Region**
  - **Leesburg and East of Rt. 621**



2007 Vertical Assets Inventory

Mostly centered around central & eastern Loudoun

40…..Communications Towers
10…..Water Tanks
15…..Power Mounts
  1… Silo
  2… Wooden Poles
  4…. Stealth Technology
10…..Roof Tops
11…..Outside County Towers with Loudoun Influence

-Total of potential of 146 “Slots” to Co-locate in Inventory

Sites "Approved" Since 2007

(Note: Not all Sites have been built)

SITE ID	APPLICANT	COMMUNIITY	ADDRESS	TYPE	AGL-ft.
LOU-044	CWS	Taylorstown	13514 Springhollow Ln.	Monopole	150
LOU-111	Verizon	Roundhill	17144 Evening Star Drive	Water Tank	120
LOU-045	CWS	Waterford	38295 Charles Town Pike	Monopole	110
LOU-046	AT&T	Middleburg	21164 Steptoe Hill Road	Monopole	120
LOU-049	AT&T	Hamilton	39098 Irene Road	Monopole	110
LOU-050	T-Mobile	Leesburg	18756 Harmony Church Road	Silo	75
LOU-051	Invs. Tower	Bluemont	18923 Railroad St	Silo	110
LOU-610	Sprint/Nextel	Leesburg	Gleedsville Road	Rootop	110

Summary (Source LOLA)

- 9 – Commission Permit (CPMT) Approvals since 2007
  - 7 Towers
    - 5 – monopoles
    - 2- Stealth Trees

    Average Height : 115’ AGL
  - 2 Structures
    - 1 Water Tank
    - 1 Rooftop
- Several in Community Development Stage
  - Not all built as of this Study

Estimated Cost of Wireless Communications Facilities

- Planning Phase
  - Engineering, Survey & Site Plan, NEPA & Section 106, FAA & FCC
  - Legal
  - Marketing and Administrative
  - Total Cost……..$100,000
- Approval Phase
  - Submission, Advertising, Community Meetings, Public Hearings
  - Total Cost……$35,000
- Construction Phase
  - Permitting, Site Prep, Construction (Steel/Concrete), Power, Telco
  - Total Cost (195')……$125,000
  - (150')……$100,000
  - (120')……..$85,000
  - (100')……..$75,000
  - (80')……$65,000
- Completion Phase
  - Total Cost……$25,000

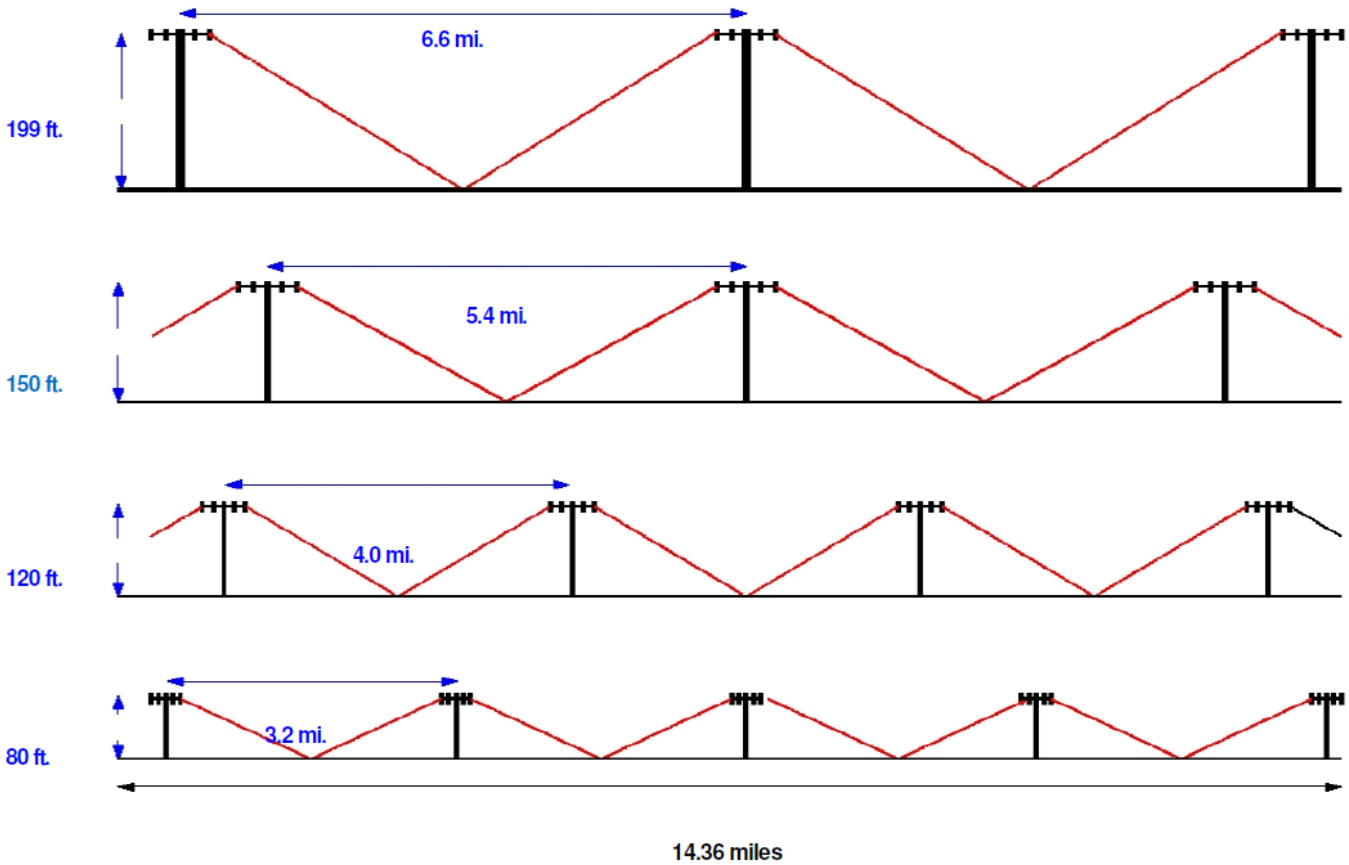
- Estimated Total Cost……..$225,000 -$300,000

- Stealth Technology……..Add Approx. 35%

What is a Successful Wireless Broadband "Connection" ?

- "Down-Link" and "Up-Link" equal is transmission strength and reliability.
- Capacity to handle "Average Rate of Bits of Information".
- Minimum "Interference" of objects and radio frequencies.
- Reliable Equipment

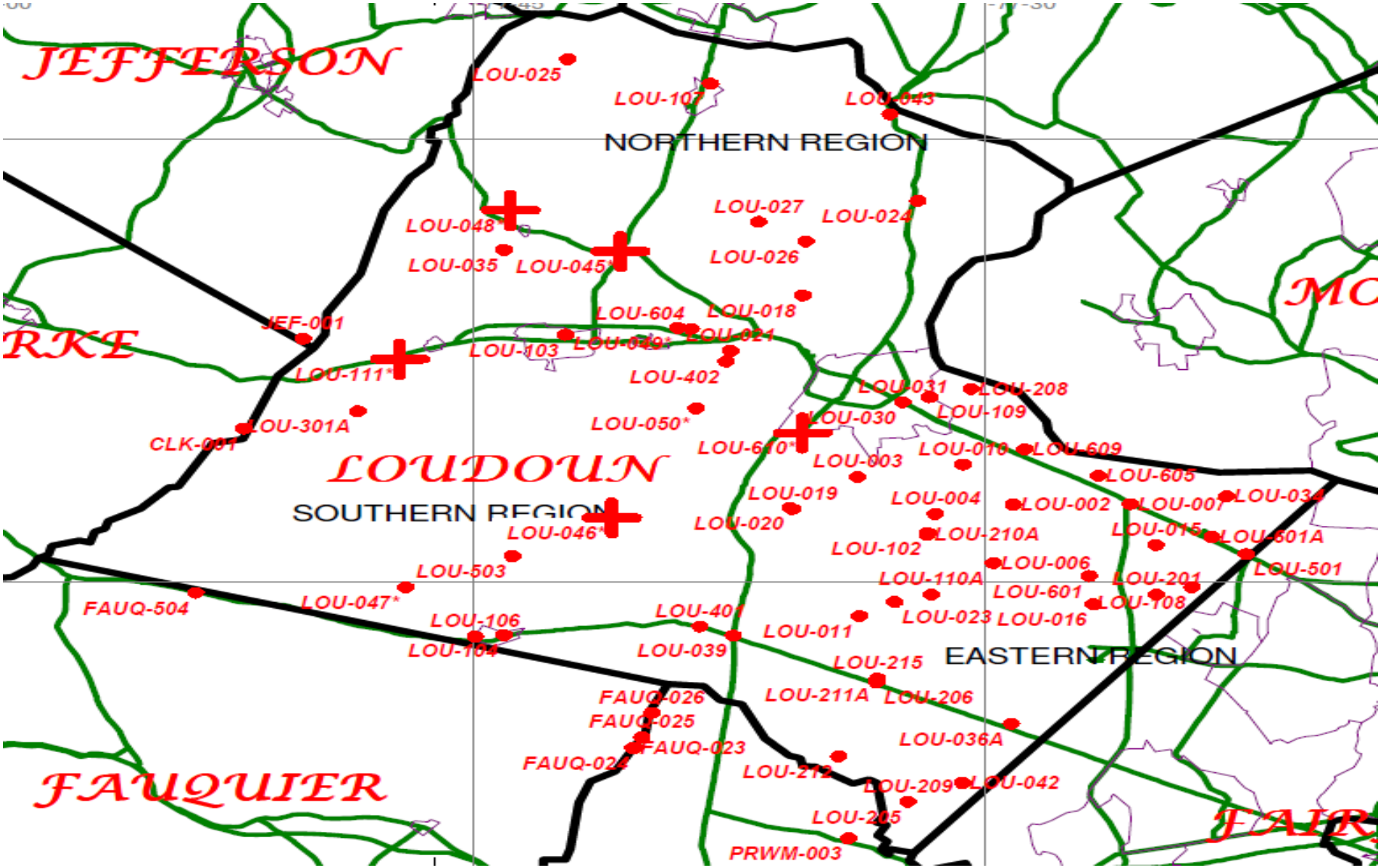
"Rule of Thumb of Tower Distances –LTE Service"



Rule to Remember:

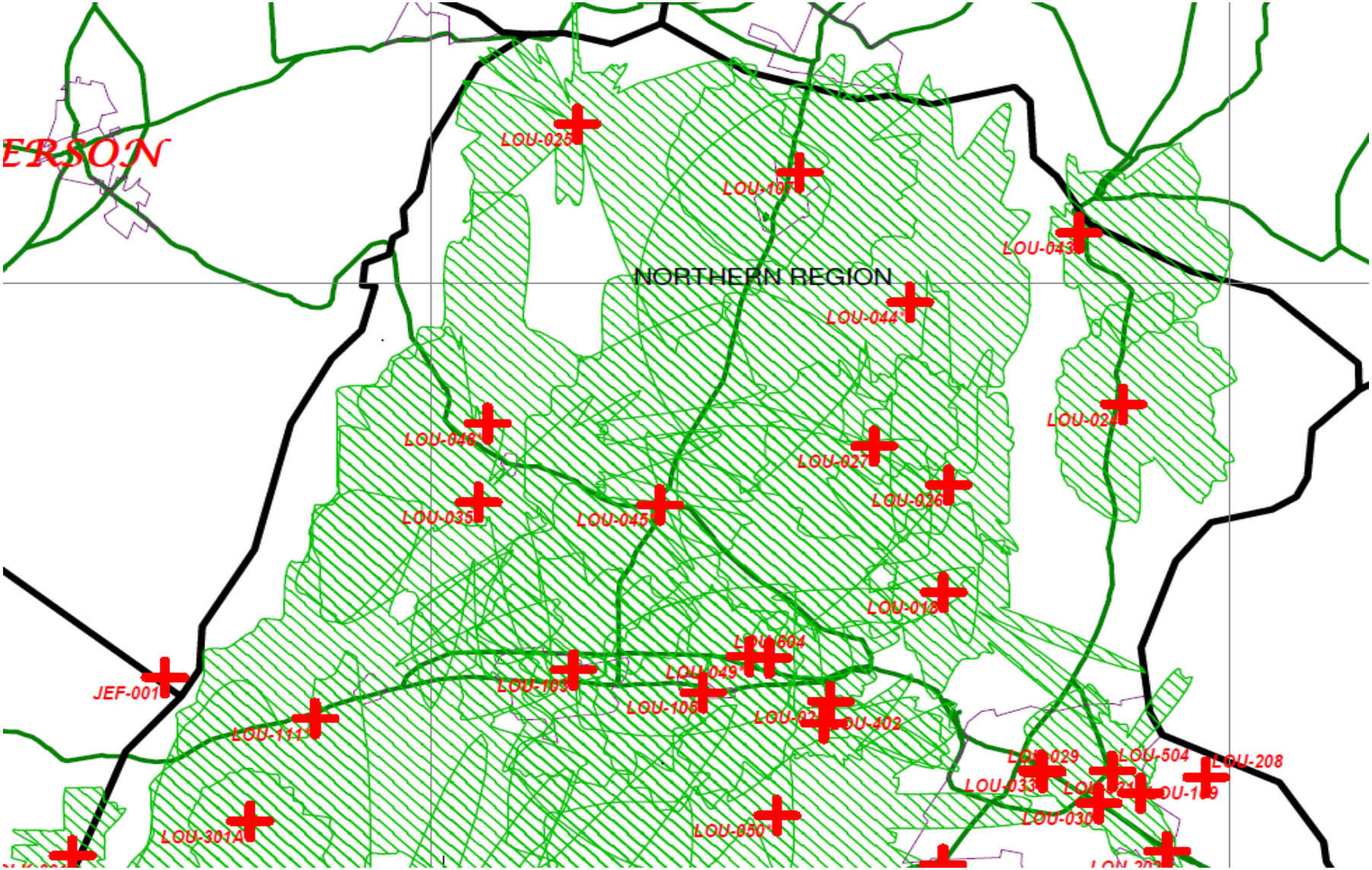
Height and distance are but only two (2) pieces of data required to estimate coverage of service areas. Characteristics such as antenna "Gain", Transmission Line "Loss", Curvature of the earth, foliage, location of PDA, antenna patterns, antenna tilt, jumper line loss, Amplifiers, weather, etc are all part of the calculation of a coverage "prediction". In all there are 23 pieces of data that must be input to have a successful estimate on coverage.

2014 – All Tower Sites

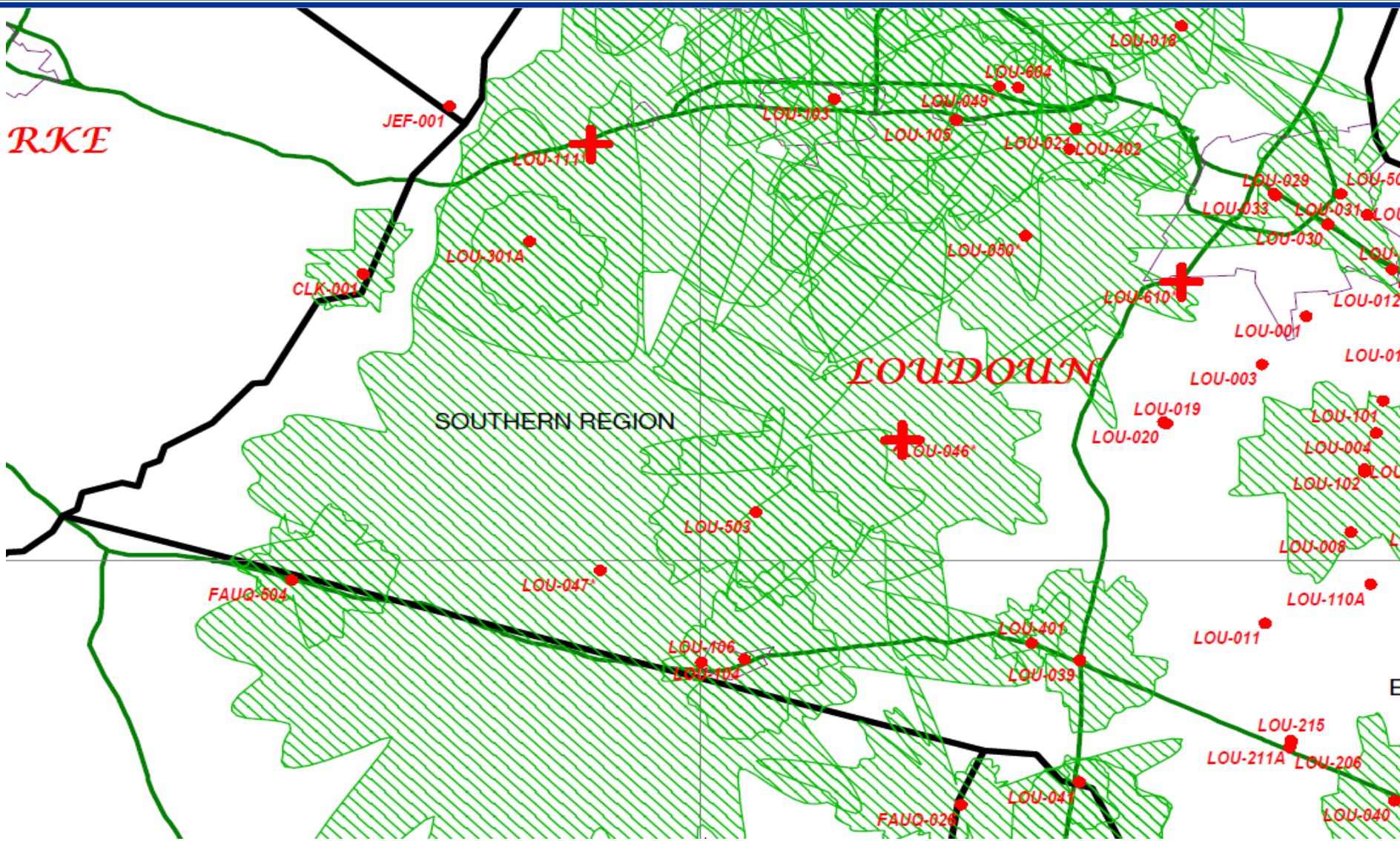


"Theoretical" Northern Region – Cell: LTE/4-G

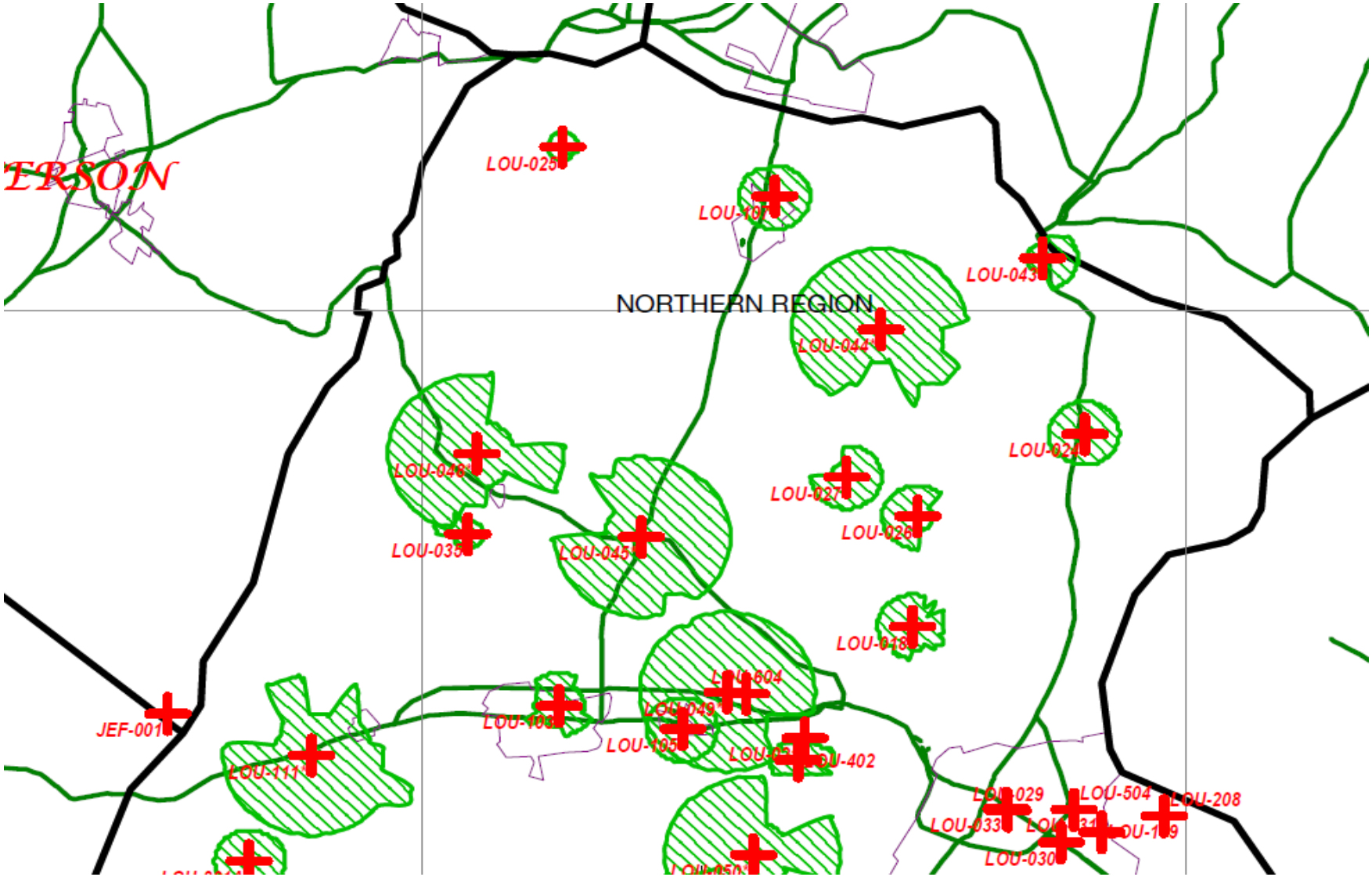
(Theoretical: If all carriers co-located on each tower)



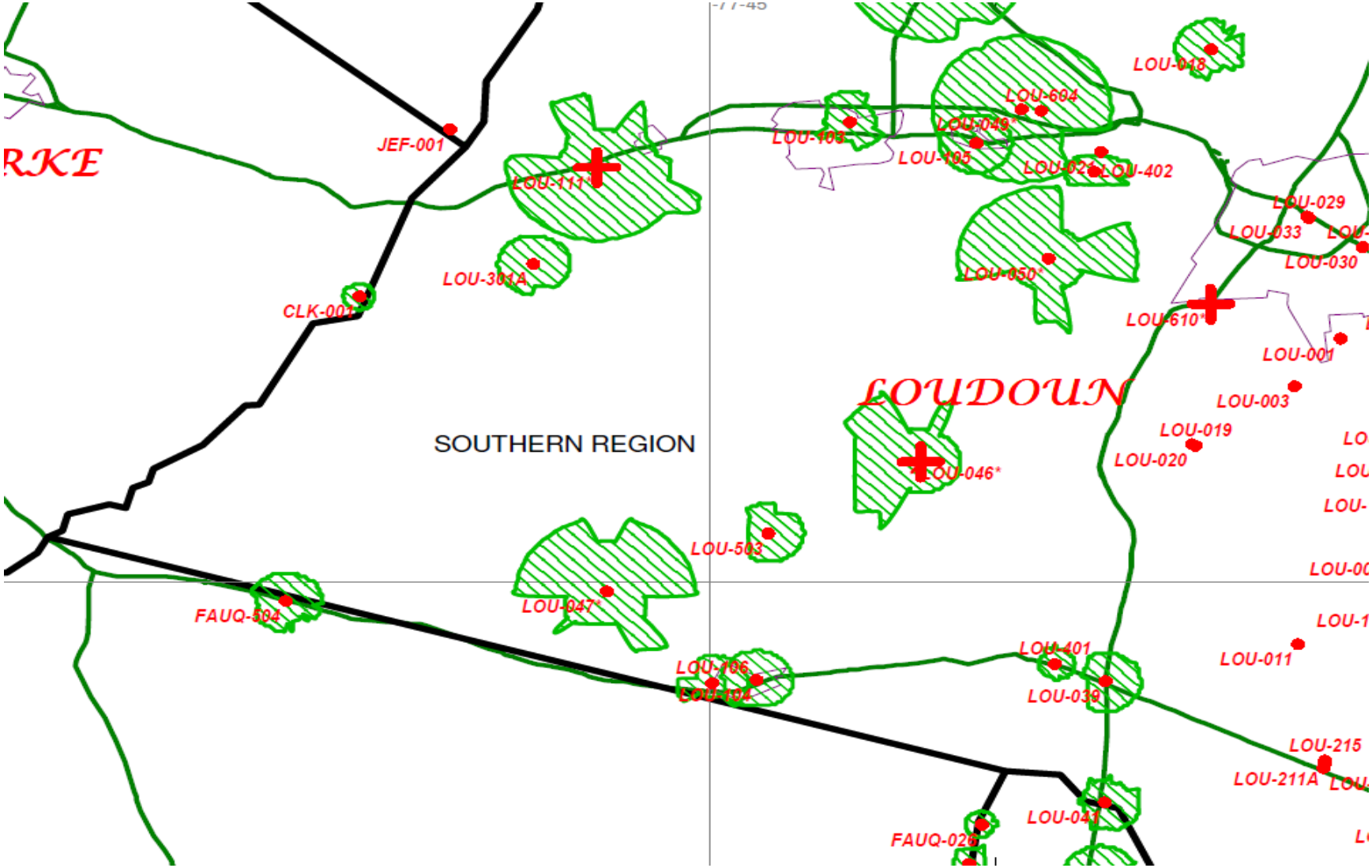
"Theoretical" Southern Region – Cell : LTE/4-G



"Theoretical" Northern Region - WISP



"Theoretical" Southern Sector - WISP



Estimated Towers by Region

FORECAST OF TOWERS
BY AREA BY HEIGHT BY TECHNOLOGY

Technology	Northern Loudoun					Southern Loudoun					Eastern Loudoun				
Tower Height-Feet	195	150	120	100	80	195	150	120	100	80	195	150	120	100	80
Cellular : LTE/4-G	2	3	4	5	6	7	10	10	18	21	3	3	3	3	5
Fixed Wireless 900 MHz	6	8	10	14	16	10	14	18	24	28	3	4	5	7	8
Fixed Wireless 2.4 and 2.5 GHz WISP	7	10	14	18	20	12	17	22	30	34	3	5	6	8	10
Fixed Wireless 4.9 and 5.8 GHz WISP	7	11	14	20	22	12	18	23	33	37	3	5	6	9	10

Total Countywide

Estimate Per Region : # per height/region

Notes:

These are estimates for various carriers to co-locate on vacant slots on the structure.

Non-Cellular un-licensed providers must coordinate radio frequency deployment not to interfere with another un-licensed carrier.

All technologies can co-locate on each tower, however there must be tower planning for this.

Examples of Low Profile Towers

80’ AGL
Monopole

100’ Stealth Silo
Battle
of the Wilderness
National Park

120’ AGL Stealth Tree
at
Mount Vernon National Park

Consultant's Recommendations

1. Consider hosting a *Broadband Summit* for service providers in the County annually.

   Invite Wire and Wireless Service Providers, County Economic Development, Planning, IT, Education Departments & the PUBLIC.

   (Broadband Council to host)

   Discuss

   1. Roadblocks to Service Delivery
   2. Goals and Objectives of Service Providers
   3. County "assistance" in Broadband Deployment

2. Modify Planning and Zoning Ordinance to Allow "By-Right" communications Facilities (Administrative Review) for 80' AGL or less pending meeting all Zoning and Planning requirements pre-established. Greater than 80' AGL, follows existing Procedural path.

3. All sites greater than 80' but less than 120' must be deployed using "stealth" technology in Scenic and Historical areas as defined by the County, COVA and EPA/DoI/NPS.

4. Use of County owned property. (Parks, Convenience Centers, Surplus land etc.)

5. Consider Dept. of Public Works/Utilities to provide assistance of placement of wooden poles on Utility Right of Ways for fee for WISP providers.